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19. ABSTRACT (Continue on reverse if necessary and identify by block number) Preadolescents do not respond to extremely hot, or cold, environments in the same ways that adults do. This brief article is written in an "ask the expert" format, per request of the journal editor, to describe the physiological responses of children for the athlete, practitioner and researcher. This article describes the responses of children, in comparison to adults, during exercise in hot and cold environments, as well as during swimming. Brief explanations for differences between children and adults are given.				
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Q: Do prepubescent children respond differently from adults, when exposed to extreme environments?

A: Prepubescent boys and girls should not be expected to respond in the same way that adults do. In hot environments (air temperature greater than skin temperature), children who engage in continuous exercise or competitive physical activities lasting longer than 30 - 40 minutes have a greater risk of hyperthermia than adults. The following five factors may play a role in this relative heat intolerance. 1. Children produce more heat per pound of body weight than adults, when walking or running. 2. Children produce approximately 40 % less sweat per sweat gland. 3. Children have a greater surface area per pound of body weight than adults, and theoretically absorb more heat from the surrounding environment, when air temperature exceeds skin temperature. 4. Children have a lower maximal cardiac output (amount of blood pumped by the heart per minute) than adults; this limits maximal skin blood flow, which in turn limits maximal heat loss via convection. 5. The rate of heat acclimatization is slower in children than in adults.

In cold environments, children theoretically lose more heat than adults because of their relatively large surface area per pound of body weight. Hypothermia is especially significant in swimming because heat transfer in water may be over 25 times greater than in air. Heat loss is a function of body fat, and not the ability to constrict skin blood vessels, indicating that lean swimmers are at increased risk of hypothermia. Also, the youngest swimmers (age group 8 to 18 years) apparently have the fastest rate of heat loss in 68°F water, even though body fat generally decreases as children grow into adolescence.

Suggested Reading

1. Bar-Or, O. Climate and the exercising child--a review. International Journal of Sports Medicine 1:53-65, 1980.
2. Bar-Or, O. The child athlete and thermoregulation. In: Exercise and Sport Biology, PV Komi (ed.). Champaign, IL: Human Kinetics, 1982.
3. Sloan, RE and Keatinge WR. Cooling rates of young people swimming in cold water. Journal of Applied Physiology 35:371-375, 1973.

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